Natural Heritage & Endangered Species Program
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Riffle Snaketail Dragonfly

Ophiogomphus carolus

State Status: **Threatened**
Federal Status: None

DESCRIPTION: The Riffle Snaketail (*Ophiogomphus carolus*) is a large, stocky insect belonging to the order Odonata, suborder Anisoptera (the dragonflies). The clubtails (family Gomphidae), to which this species belongs, are one of the most diverse families of dragonflies in North America with nearly 100 species. Clubtails are unique among the dragonflies in having eyes that are separated from each other. These insects, as their name implies, have a lateral swelling near the end of the abdomen which gives it a club-like appearance. The Riffle Snaketail is a member of the genus *Ophiogomphus* (the snaketails). These dragonflies are characterized by their brilliant green thorax, eyes and face. The swelling in the abdomen of the Riffle Snaketail forms a club that is over half the width of the thorax. Although the exact purpose of this swelling is not known, it might be used in courtship displays or to improve aerodynamics in flight. The abdomen is black to dark brown with pale green to yellow markings down the sides, largest at the "club". Also, there is a string of wide, yellow markings that run down the top of the abdomen. These markings resemble rearward-pointing daggers that are constricted in the middle. The wings are clear, supported by a dense network of black veins. Riffle Snaketails perch horizontally on rocks, logs, vegetation or the ground with their wings held horizontally, like those of an airplane.

Adult Riffle Snaketails range from about 1.6 to 1.7 inches (41 to 44 mm) in length. Although the female is similar in coloration, she is larger than the male with a much reduced club near the tip of the abdomen.

SIMILAR SPECIES: Although snaketails may be easily recognized to genus by their brilliant green thorax and face, it is sometimes difficult to identify them to species. Five species of *Ophiogomphus* have been recorded in Massachusetts. All of these are similar in coloration, size and shape. The shape and size of the dorsal abdominal markings differ between species and may help to identify the various species of *Ophiogomphus*. However, these markings can be variable and should be used in combination with other factors to make definitive identifications. The most reliable way to distinguish males of the genus *Ophiogomphus* from each other is by examination of the terminal abdominal appendages and hamules (organs located on the underside of segment 2) (as shown in Walker (1958) and Needham *et al.*(2000)). Females may be identified to species by the shape of their vulvar lamina (located underneath segments eight and nine) and by the shape of small spines and bumps located on top of the head (as shown in Walker (1958) and Needham *et al.* (2000)).

The nymphs can be distinguished by characteristics of the dorsal spines on the abdomen and characteristics of the antennae, as reported in keys by Walker (1958) and Soltesz (1996).

HABITAT: Riffle Snaketails inhabit clear, cold, and rocky streams that are fast-flowing with relatively few pools. The bottom sediment is made up of fine gravel or sand in which the nymphs of the Riffle Snaketail burrow.

LIFE-HISTORY/BEHAVIOR: Riffle Snaketails, like other members of the *Ophiogomphus*, fly during the late spring and early summer. Emergence usually takes place in late May and the adults fly throughout the month of July. There have been few publications on the habits and haunts of the Riffle Snaketail. However, published reports of other similar species are most likely applicable. Dragonflies, like their cousins the damselflies (suborder Zygoptera), have two distinct life stages: an aquatic larval stage (nymph) and a flying adult stage.

Riffle Snaketail nymphs, like many clubtail nymphs, spend much of their time burrowing in the bottom sediment. This habit not only provides them with protection from predators, but may also provide them with camouflage or a hiding spot from which they can capture prey. Dragonfly and damselfly nymphs have a unique feeding apparatus, a moveable, hinged labium or lower lip that can be extended to capture prey. Potential prey of the Riffle Snaketail includes aquatic invertebrates, small fish and tadpoles. It is not known how long it takes for the nymph of the Riffle Snaketail to fully develop. However, full development takes about year in dragonflies of similar size.

RIFFLE SNAKETAIL FLIGHT PERIOD

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

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The final step of development before becoming a flying adult is eclosure (or emergence). This is the process by which the adult dragonfly emerges from the larval (nymphal) exoskeleton (the exuviae). The nymph of the Riffle Snaketail crawls up directly onto exposed rocks in the stream bed, or onto the bank of the stream to emerge. It may also utilize logs jutting out of the water and even bridge abutments. Upon finding a secure perch, usually less than a foot above the water's surface, the adult pushes out of the larval exoskeleton and stretches its wings. The new adult is very soft and vulnerable at this time. In the first few hours following emergence, adults can be damaged by rain showers, falling debris, and predators. As a result the adult makes its maiden flight into the woods that surround the breeding habitat as soon as possible. Away from the water, the dragonfly can find relatively safe shelter among the leaves and branches of trees. During this time of wandering and maturation, adult dragonflies can also be found in fields and in forest clearings, sometimes far away form the breeding site, feeding on small aerial insects such as flies and mosquitoes.

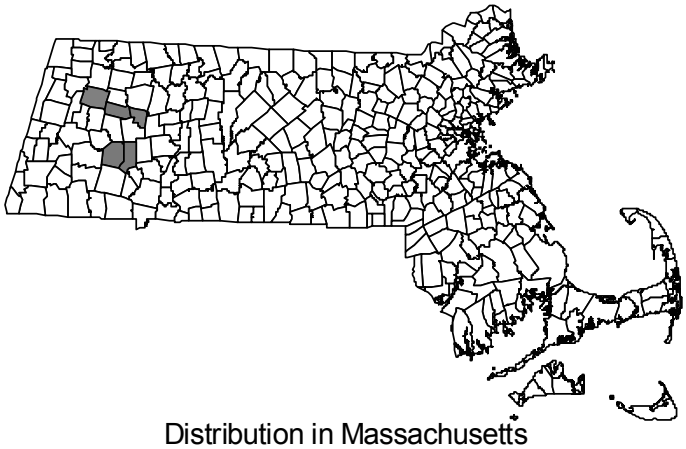
In Massachusetts, the Riffle Snaketail probably breeds from early June through late July. Upon returning to the stream, male Riffle Snaketails can be found perching on rocks in the middle of the streams. From these exposed perches they make swift patrols out over the water, often returning to the same or a nearby rock. During these patrols, the males are primarily searching for mates and driving off any potential competitors. Females spend little time around the breeding habitat, except during the brief time when they are ready to mate and lay eggs.

When a female is found, the male Riffle Snaketail will grab her in back of her eyes with his terminal abdominal appendages. A receptive female will position the tip of her abdomen, where her reproductive organs are located, at the hamules (secondary sexual structures) of the males, which can be found on the underside of the second segment. This is known as "the wheel position", with the male on top and the female below. The joined pair will immediately fly up into the surrounding forest, most often into the very tops of the trees, where mating occurs.

Mating may take from less than one minute to over an hour depending on the species. It is not known how long it takes in the Riffle Snaketail. When mating is completed, the female returns to the water in order to deposit her eggs. Female Riffle Snaketails oviposit alone by tapping the tip of their abdomen to the surface of the water. This is usually done around a riffle in the stream as she flies rapidly back and forth over the water.

RANGE: The Riffle Snaketail occurs from the Maritime Provinces west to Ontario, Minnesota, and Michigan, south to Ohio, Pennsylvania, northern New Jersey, and Massachusetts. In New England, the Riffle Snaketail is found in Massachusetts, Vermont, New Hampshire and Maine.

POPULATION STATUS IN MASSACHUSETTS: The Riffle Snaketail is listed as a Threatened species in Massachusetts. As with all species listed in Massachusetts, individuals of the species are protected from take (picking, collecting, killing, etc…) and sale under the Massachusetts Endangered Species Act. The species is known from only a few river systems in western Massachusetts. Further study may reveal more populations at suitable habitat in the western portions of the state. As with many species of clubtails, population densities appear to be fairly low. However, this may be due to the elusiveness of the adults. Surveys focusing on the nymphs of the Riffle Snaketail, which are easier to find than the adults, should give a more accurate representation of the species status in Massachusetts.



Distribution in Massachusetts
1977 - 2002
Based on records in Natural Heritage Database

MANAGEMENT RECOMMENDATIONS: As for many rare species, the exact management needs of the Riffle Snaketail are not known. Alteration of water quality is certainly a threat to the maintenance of their populations in Massachusetts. Threats to water quality include industrial pollution and salt and other run-off from roadways. Also, as an inhabitant of lotic habitats, this species may also be particularly vulnerable to alterations in stream flow damming or water diversion projects. The upland borders of these lotic systems are also crucial to the well-being of odonate populations as they are critical for feeding, resting, and maturation. Development of these areas should be discouraged and preservation of the remaining undeveloped upland bordering the river should be a top priority.

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